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"DRUZHBA ADRIA" PROJECT – MANAGING BALLAST WATER PROBLEMS

„Druzhba Adria" projekt – problemi postupanja s balastnim vodama

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Abstract

Ballast water is an increasing problem in the Adriatic Sea, today. Together with global warming effects of new species found in it, realization of "Druzhba Adria" project could furthermore threaten the Adriatic Sea sensitive eco-system. With fivefold increase in the amount of ballast water discharged, estimated by DnV and Fridtjof Nansen Institute, "Druzhba Adria" project would significantly influence ballast water problem in Croatian part of the Adriatic Sea.

Ballast Water Management problem in "Druzhba Adria" project will be discussed in this paper and new Ballast Water Methods Assessment Criteria introduced.

Keywords: "Druzhba Adria" project, ballast water management, BW methods assessment criteria

Sažetak

Problem balastnih voda se danas sve više povećava u Jadranskom moru. Zajedno s učincima globalnoga zagrijavanja zbog djelovanja novih uvezenih vrsta organizama nađenih u njemu, realizacija projekta „Druzhba Adria" može dodatno ugroziti osjetljivi eko-sustav Jadranskoga mora. S petorostrukim povećanjem količine ispuštenih balastnih voda, procijenjenih od DnV-a i Fridtjof Nansen Instituta, „Druzhba Adria" projekt mogao bi znatno povećati problem balastnih voda u hrvatskom dijelu Jadranskoga mora.

U ovom će se radu razmotriti problem postupanja s balastnim vodama u projektu „Druzhba Adria", te uvesti nove kriterije za ocjenu metoda za njihovo tretiranje.

Ključne riječi: Projekt „Druzhba Adria", upravljanje balastnim vodama, kriteriji za ocjenu metoda tretiranja balastnih voda.

1. Ballast Water problem with Druzhba Adria project

Problem balastnih voda i projekt „Druzhba Adria"

1.1. „Druzhba Adria" project

Projekt „Druzhba Adria"

"Druzhba Adria" is the project that should connect pipelines "Druzhba" ("Friendship" pipeline) and "Adria" (Adriatic pipeline - JAdranski NAFtovod) in the direction from Samara in Russia to Omišalj port in Croatia, as shown on 0. "Adria" pipeline is currently capable of crude oil transportation from the Adriatic Sea to Russia, so Omišalj is the import port. Ships are arriving full of cargo in Omišalj port and taking ballast there. "Druzhba Adria" project would turn Omišalj to export port too, and ships will arrive in Omišalj in ballast condition with discharge of large amounts of ballast water in the Adriatic Sea.

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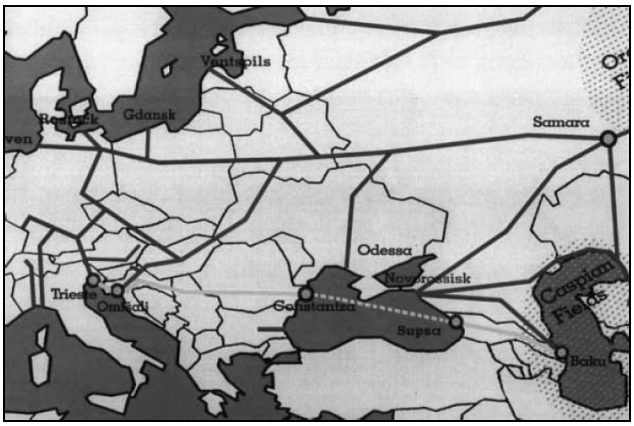

Figure 1. Druzhba Adria project [1]

Slika 1. Projekt Druzhba Adria

With "Druzhba Adria" project, Omišalj will become the first export-import crude oil port in the Mediterranean.

Ballast water problem could be significantly increased because of new direction of oil transport.

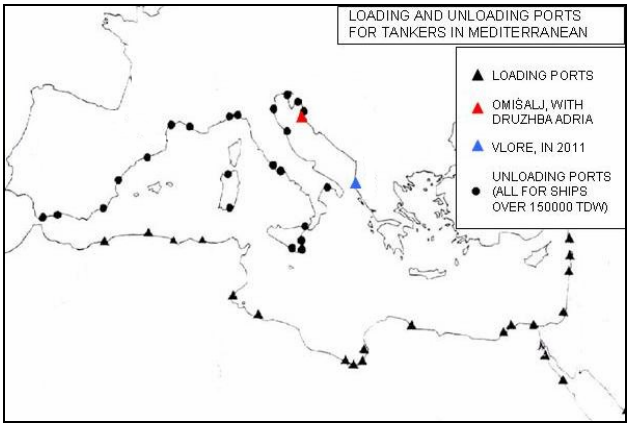

Figure 2. The ports in the Mediterranean Sea [2]

Slika 2. Luke u Sredozemlju

1.2. Crude Oil Transport Plan

Plan prijevoza sirove nafte

According to transport plan, project is divided in 3 phases:

- Phase I: In 1st year of the project, 5 million tones of crude oil.
- Phase II: In the next 5 years (2. – 6. Year of the project), 10 million tones of oil every year.
- Phase III: In the next 5 years (7. – 11. Year of the project), 15 million tones of oil every year.

According to the "Druzhba Adria" project realization plan, the Phase I should start in year 2004. But after discussions regarding ecological problems in Croatia the project was postponed.

1.3. Ballast Water Problem

Problem balastnih voda

The amount of ballast water discharged from one average merchant ship per voyage is about 30% to 40% of her deadweight. It means that with "Druzhba Adria" project the amount of ballast discharged in the Adriatic will raise for another 5-6 million tones in the last phase of the project. By FNI and DnV estimation, the increase in ballast water discharge will be about 5.5 million tones. There were about 5.6 million tones of ballast water discharged in the Adriatic Sea in 2003, [4], as shown in 0.

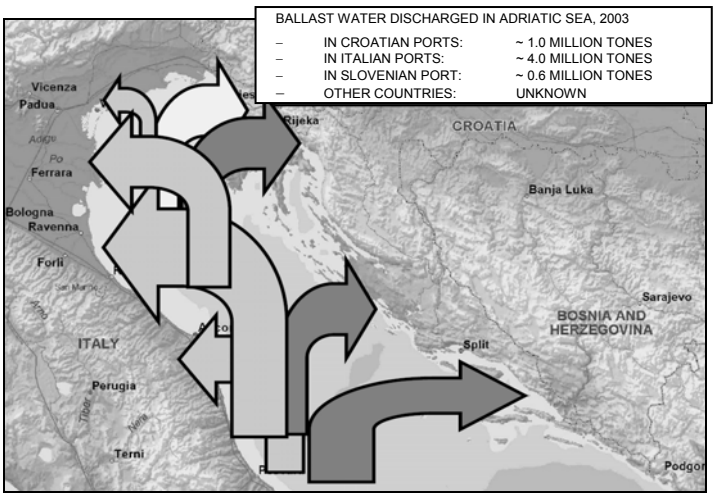

Figure 3. Ballast waters discharged in the Adriatic Sea in year 2003, [4]

Slika 3. Balastne vode ispuštene u Jadranskomu moru 2003. godine

Together with about 1.7 million tones of ballast water discharged in the first phase of the project, the amount of ballast water will raise very quickly to 7.2 million tones or about 30%. This figure will be doubled in 6th year of "Druzhba Adria" project to about 11 million tones of ballast water discharged.

2. Ballast Waters Regulations for Sea-going Ships

Propisi balastnih voda za pomorske brodove

IMO has delivered regulations A. 868(20), [5], regarding ballast water management on ships in 1997. After further recognizing ballast waters problem, they delivered International Convention for the Control and Management of Ships' Ballast Water and Sediments, [6], in 2004. Regarding exchange of ballast at sea, IMO states that the distance from the shore of 200nm and the depth of the sea of 200m, thus weakening previous recommendations where 2000m were stated. The reason for this weakening is not known and is not in the correlation with current situation with sea environmental problems. Furthermore, Croatia and Slovenia required more weakening of those regulations for the Adriatic Sea asking that ballast water exchange procedure can be performed at distance 50nm from the shore, and that was included in the Regulations.

That requirement was brought without creating Ballast Water Management Assessment Criteria delivered in this paper.

In so called BW Convention, [6], IMO defines time-schedule for implementing some of Ballast Water methods with some items:

- For existing ships ballast exchange method is determined to be used until 2016 when ballast water performance standard (Reg. D-2) should be implemented.
- New ships built after 2009 shall conduct ballast water management that at least meet ballast water management standard (Reg. D-2).

According to present state with ballast water regulations, tankers carrying oil in "Druzhba Adria" project can be old tankers, not designed for ballast water management needs.

3. The Current Situation in Croatia Regarding Ballast Water Problem in Adriatic Sea

Sadašnja situacija u Hrvatskoj s obzirom na problem balastnih voda u Jadranskomu moru

The 50nm distance from shore requirement in IMO Reg. A. 868(20) is exception asked by Croatia and Slovenia, in 2003 with intention to solve ballast water problem with Ballast Water Exchange method by discharging ballast somewhere in south-east Adriatic. But in 2005, the government specialists change their mind and published information that the Adriatic Sea is not appropriate for Ballast Water Exchange methods.

It is obvious from 0, bellow, that Exchange methods cannot be performed in the Adriatic Sea. The time required for Exchange methods performance is about 1 day for Sequential method, with exception on bulk carriers, and 2-3 days for Flow-through method.

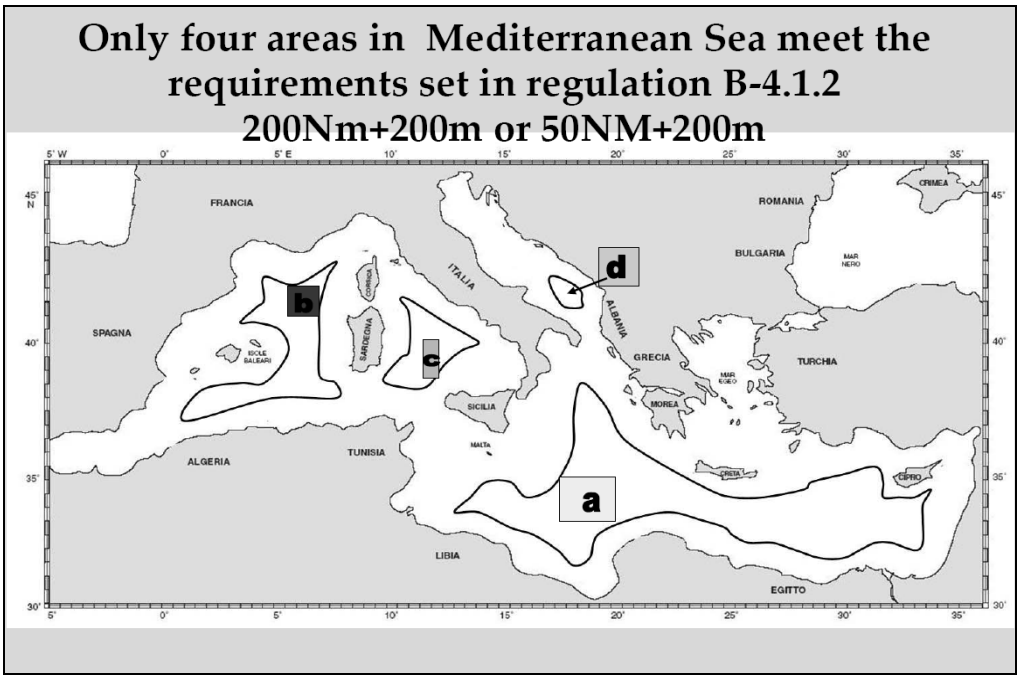

Figure 4. Areas in Mediterranean Sea for Ballast Water Exchange, [4]

Slika 4. Područje u Jadranskomu moru gdje se ispuštaju balastne vode

Figure 4 above shows very short area where ballast water exchange can be performed in the Adriatic, measuring in length about 100nm, only.

There were talks that Ballast Water Exchange procedure will be performed somewhere in Mediterranean, but this was never confirmed.

The merchant ships (tankers and bulk carriers) with about 14kn need about 24 hours from Otrant doors to Omišalj (about 630km). It means that ships shall travel with less speed to accomplish ballast water exchange task, and thus lost a day or two. It is obvious from above that Croatian Government should call off 50nm distance from shore requirement.

Another big treat regarding ballast waters in Adriatic Sea is AMBO project, announced to start in 2011. It is the project of oil transportation from the Caspian Sea over AMBO oil pipeline (Albania, Macedonia, Bulgaria) through Vlore port in Albania, situated on the Otrant door at the entrance in the Adriatic Sea. In that project, Vlore will become the first export port on the northern part of the Mediterranean for large ships over 150000tdw. Because of the direction of currents in the Adriatic Sea, there should be the great danger of spreading invasive organisms in the Adriatic Sea through discharged ballast waters near Vlore. The port of Vlore is the example that Trans-boundary pollution criterion is the most important criterion in making decision about ballast water management in the Adriatic Sea.

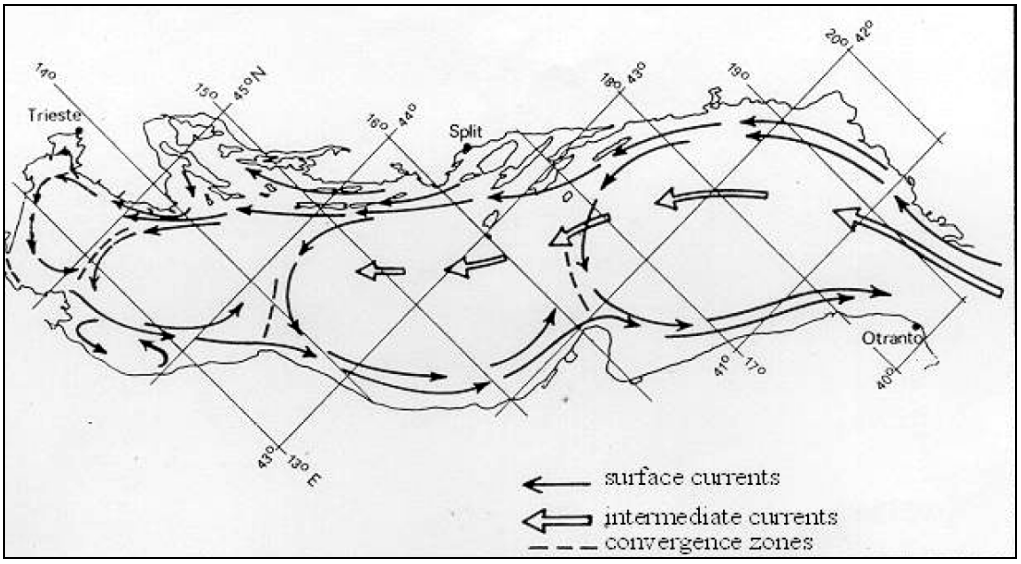

Figure 5. The general currents in the Adriatic Sea

Slika 5. Uobičajene struje u Jadranskomu moru

4. Ballast Water Methods Assessment Criteria

Kriteriji procjene u postupcima s balastnim vodama

The decision about ballast water method to be used in the particular sea area cannot be made without proper assessment criteria for methods evaluation. In this paper, new Ballast Water Methods Assessment Criteria are presented. Those criteria enable proper decision making. Croatian Government did not use those criteria in determining Ballast Water Management for "Druzhba Adria" project and they could make terrible mistake. These criteria consist of main criteria and one super criterion that influence all other criteria.

The main criteria are:

1. The Cost,
2. Feasibility/Efficiency,
3. The Possibility for Efficient Survey/ the Possibility for Penalizing.

The super criterion is:

4. Inter-influence with other countries (Trans-boundary Pollution).

Explanations of the criteria are as follow:

1. The first criterion represents cost estimation of Ballast Water management methods. It is divided on Initial Cost and Cost in Work, relating to Authorities and Ship-owner costs. The purpose of this criterion is precise the cost of the available methods and compare them. Initial Cost represents particular Ballast Water Method implementation costs and In Work Cost represents Ballast Water Device working costs. Total cost can be compared with economic figures to obtain relations. Of course, from the ecological and bio-diversification point of view, the cost of the methods is of no relevance and its significance should be minimized. The cost in US$ or EUR is to be estimated and methods compared.

2. The second criteria are the most important and show the subjective mark for method Feasibility in the specific sea area, together with Efficiency of the method. It is necessary to make Feasibility Study for decision making regarding this matter. Also, it is necessary to estimate possible impact of treatment methods on the ship and its crew. Possible marks for Feasibility are: FEASIBLE or NOT FEASIBLE, while possible marks for Efficiency are shown in PERCENTAGE OF EFFICIENCY of the methods.

3. These criteria are often skipped in all discussions, but present very important feature of decision making process. It is especially so, when looking on locked seas like the Adriatic, Baltic or Black Sea, where it is of great importance to have Efficient survey and Penalizing System. The marks for these criteria are POSSIBLE and NOT POSSIBLE.

4. Trans-boundary Pollution is super criterion, important in the sea areas under surveillance of several countries. This criterion is specific for the above mentioned sea areas where it becomes of the greatest significance. There is ESPOO Convention covering trans-boundary pollution issues in regulations about Environmental Impact Assessment in a Trans-boundary context that should have greater importance in solving Ballast Water problems and environmental problems in general.

This criterion has two possible marks: YES or NO, where YES means that criterion is applicable when making decision about Ballast Water Management for the specific sea area. When included, it is dominating criterion making BW method acceptable or not. Trans-boundary Pollution is the strongest ballast water assessment criterion.

5. Ballast Waters Management Methods for Druzhba Adria project

Načini postupanja s balastnim vodama za projekt Druzhba Adria

IMO regulations, in [5] and [6], suggest few methods for controlling ballast waters problem:

1. Exchange of ballast at open sea (ocean),

a) Sequential

b) Flow-through

2. The treatment of living organisms,

3. Ballast Water Discharge to Reception Facilities.

It is obvious from IMO regulations, that exchange and discharging to reception facilities methods are applicable for "Druzhba Adria" project, only. Treatment methods will be required after 2016 on existing ships. The description of the methods with marks follows:

1. According to IMO regulations existing ships will perform exchange methods until 2016. Their characteristics are:

a) The efficiency of sequential exchange method is estimated to 100%. But they are not applicable for all ships, especially bulk carriers. Numerous papers show problems with conducting this method, as shown in [7] and [8].

b) Flow-through method is 98.2% efficient after 4 total ballast water exchanges, while with 1 exchange there is 63,2% efficiency of the method, only, [9]. For 95% efficiency required (Reg. D-1), 3 exchanges are needed. With average 20 hours needed for 1 total ballast water exchange, about 2 and a half days are required for 3 exchanges.

Today tankers with double hull and quite separated cargo space with segregated tanks should be capable to perform sequential ballast exchange, but are not designed for it. Free surface effect during loading/unloading of liquids has the greatest effect on intact stability deterioration on all tankers, and oil tankers, too. Together with dynamic effects in the voyage, intact stability can be seriously lowered. It can be assumed that oil tankers will not be able to perform ballast water exchange in heavy seas. Considering above mentioned exchange procedure is more complicated on single hull tankers, especially VLCC and ULCC tankers with large ballast tanks. Also, the tankers today are not designed for reballasting procedures performed or any change of filling of liquid cargo during voyage.

These methods requires no initial cost and ship-owners can count on usage cost in additional ballast pumps fuel cost. But, these methods are not feasible in the Adriatic Sea, as shown in 0. Sequential method is 100% efficient only in calm weather, and in the heavy seas it is not so.

Regarding efficient survey and penalizing this method is the worst method and these criteria can be fulfilled only when ship is arriving perpendicular to the port area.

2. There are numerous ballast water treatment methods, from Mechanical and Physical to Chemical methods and their combinations. These methods vary in their efficiency and influence on human health, ships and environment.

There are several systems that eliminates invasive organisms by mixing very low-oxygen inert gas into ballast water as it moves through ballast system removing 95% of the dissolved oxygen from the water in seconds, leaving it to arrive in the ballast tanks in a deoxygenated state. This system also protects ballast tanks against corrosion.

Thus this method gives possibility of Efficient Survey and Penalizing conducting Ballast Water Treatment on Ballast Loading/Unloading. But it is not applicable for Druzhba Adria project until 2016, when it could be too late for Adriatic Sea. The initial cost of the treatment facility can be relatively large (few millions US$), with additional fuel costs. Also, there is no feasible/efficient treatment method yet, not affecting crew health, making no environment damage or not influencing ship's structure.

3. The size and capacity of reception facilities should meet requirement to accept the ballast waters from the largest ships to enter some port. In the case of Omišalj estimated initial cost of such facility is about 30 million €. Omišalj is deep port with about 30m depth and it can accept ULCC tankers with over 350000 DWT. Assuming capacity of ballast water tanks on 400000dwt tanker on about 35% of her deadweight, the capacity of ballast water tanks is about 140000 tones. But this method may be feasible in the Adriatic Sea and 100% efficient. It also could give possibility of Efficient Survey and Penalizing of the ship. With super criterion applied, this is the only ballast water management method that satisfies all Ballast Water Methods Assessment Criteria mentioned in Chapter 0.

In general, exchange methods are not applicable in the sea areas when area is under surveillance of several countries. Therefore, the necessity for regulation unification is of the greatest importance. The examples of proper behaviour are the Baltic Sea countries with Helsinki Convention, or the Black Sea countries with late Bucharest Convention.

Conclusion

Zaključak

The Discharging of Ballast Waters to Reception Facilities is acceptable Ballast Water Management Method for locked sea like the Adriatic Sea today, according to Ballast Water Management Assessment Criteria, shown here. It satisfies all stated BW Assessment Criteria for the Adriatic Sea, together with Trans-boundary Pollution super criterion. This super criterion shows that it is not possible to solve ballast waters problem for "Druzhba Adria" project alone.

Relatively large initial cost of such facilities (about 20-30 mill US$ per harbour) is negligible compared to 6-7 billion € earnings Croatia has from Tourism and Fisheries, annually. Croatia has not satisfied MARPOL 73/78 Annex I Requirements for building reception facilities for oiled waters in its harbours, yet. The oiled waters problem can be solved together with ballast water problem in Croatia, using Reception Facilities. According to MARPOL, the Adriatic Sea was identified as Special Area in 1973 and there is nor legal not technical obstacles not to raise environmental protection safety in the Adriatic Sea in total.

Regarding Ballast Waters Regulations it is previously stated that Croatia and Slovenia asked for lowering the distance from the shore requirements on 50nm without making Exchange method Feasibility study. That regulation should be changed and call off to 200nm, without exception. The ballast water management method used must be 100% efficient, leaving no smallest possibility of some harmful organism invasion, like different kinds of *Caulerpae* already did in Croatian part of the Adriatic Sea.

The final conclusion is that the Adriatic Sea countries should deliver Adriatic Convention for environmental protection of the Adriatic Sea, based on the knowledge and practice from the Baltic and Black Sea countries. After delivering such convention, the ballast water problem in the Adriatic Sea should be solved on its entrance, on Otrant door, on Italian side because of the orientation of the currents, as shown in 0. The ships should be surveyed there and no ship with ballast water not exchanged could be able to enter the Adriatic Sea.

The discharging of ballast waters to reception facilities is the most efficient method until then.

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